Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

Canada

The National Land and Water Information Service

Soil Information in Canada: Upgrade and Delivery

Scott Smith, Gary Patterson and Xiaoyuan Geng,
Agriculture and Agri-Food Canada

Presentation to the NRCS National Cooperative Soil Survey Conference, Madison WI June 7, 2007

www.agr.gc.ca/nlwis-snite

Outline

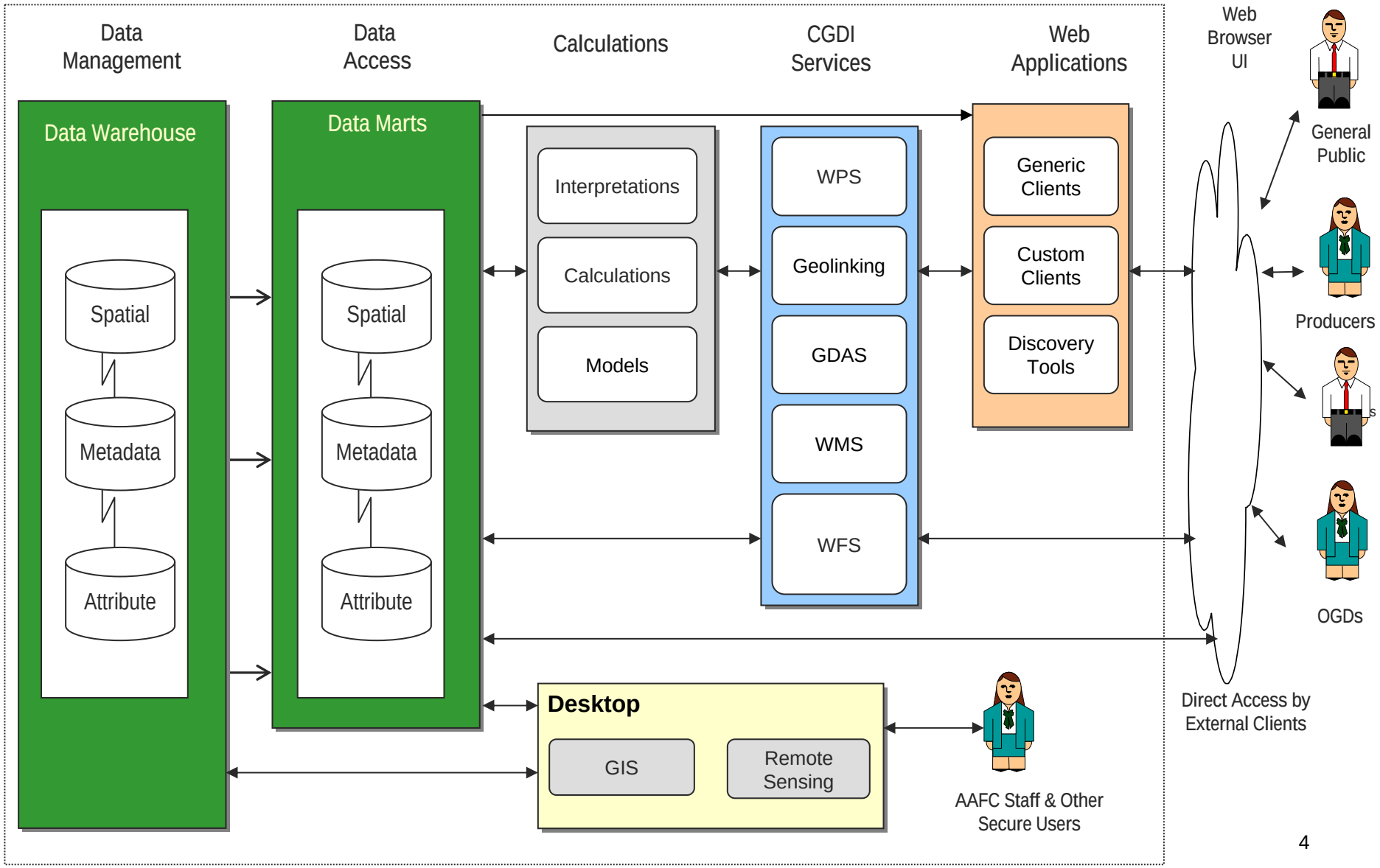
- Brief overview of new information National Land and Water Information Service initiative
- Composition of the federal soil resource group (federal soil survey)
- View of the Canadian Soil Information System
- Strategic planning for the group
- Overview of the current activities in detailed mapping, broad-scale mapping, interpretations, development of the national pedon database

What is the National Land and Water Information Service?

Agriculture and Agri-Food Canada's on-line, agricultural information service to:

- provide access to a range of spatial data through a public Internet portal,
- Utilize recognized standards for interoperability, metadata and web services,
- enhance the quality of, and access to, agri-environmental geographic data (soil, water, climate and biodiversity) on a national basis,
- develop agricultural decision support tools (interactive applications), and
- make available land and water expertise (user support).

N-GIS High Level Architecture



Service Components

The National Land & Water Information Service will provide:

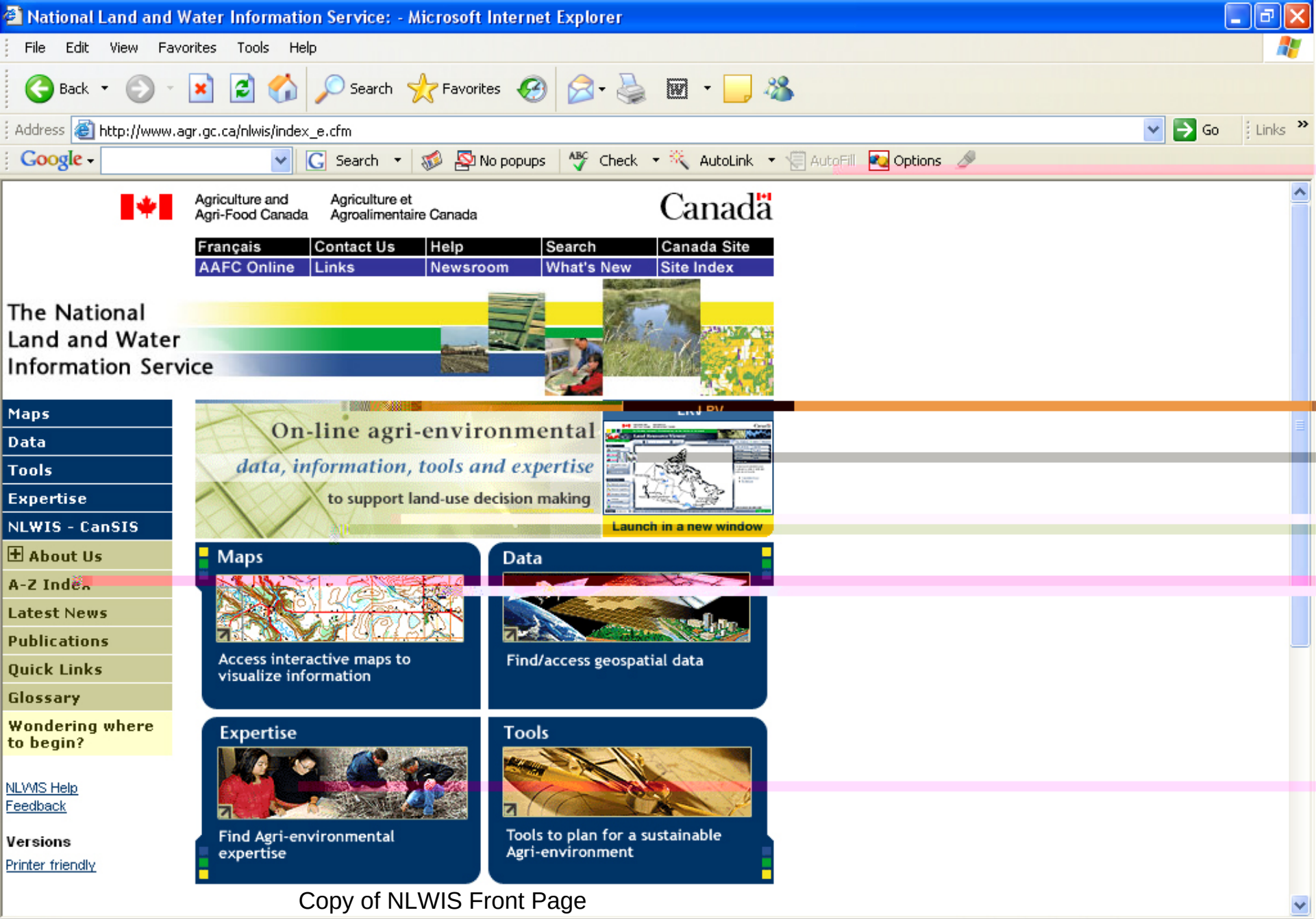
- **Applications** that meet user needs to support decisions.
- **Data** that is current, accurate and at an appropriate scale.
- **Partnerships and Collaboration** with other governments, agencies both federal and provincial to develop, or share access to existing, soil, water, climate and bio-diversity information.
- **IM/IT infrastructure** built on GeoConnections principles. This will be a network of independent servers and databases accessible through the Internet which are housed at AAFC and its many partner agencies.
- **Expertise/Outreach** that includes knowledge management, the capacity to interpret the information and to collect and maintain the Service.

Data Development Activities

- Maintenance of Current Data Sets
  - NLWIS through its maintenance of the Canada Soil Information System (CanSIS) is the authoritative source for Soils data in Canada
  - Soils data are collected, maintained and accessed in CanSIS as part of the overall NLWIS service.

- New Data Development
  - Undertaken to support the core business of AAFC/NLWIS and reflect the detailed business requirements
  - Expertise resides within AAFC
  - Most data development activities will continue post NLWIS

- Data Acquisition
  - Occurs when AAFC is not source of primary data (e.g. water, climate) Work in collaboration with data owner
  - Partnership Office negotiates agreement to acquire required data from partners



Copy of NLWIS Front Page

Impacts on federal soil survey

- CanSIS no longer stand-alone entity within AAFC
- Loss of independence and flexibility
- Data updates no longer ad-hoc but part of a formal release schedule
- Centralized support for IT infrastructure licensing not available previously
- New information management technology
- System architect for new enterprize system (NLWIS) is former Head of CanSIS

AAFC Soil Resource Group (Federal Soil Survey)

- Headquartered in Ottawa with CanSIS staff and Ontario regional unit
- Regional units of 2 to 6 staff in each province
- Total staff of 60 pedologists, soil technicians and geomatics specialists
- Supported by IT staff, Applications, and Partnerships staff elsewhere within the National Land and Water Service
- Using contractors in northern territories and Newfoundland
- Size of the group has dimenished over last 10 years but is up over the last 2 years

Federal Soil Resource Group

Components and Functions

Regional Units

•65% of effort

Function: Field data collection, synthesis, validation and product development

Landscape and Pedological Research

•15% of effrot

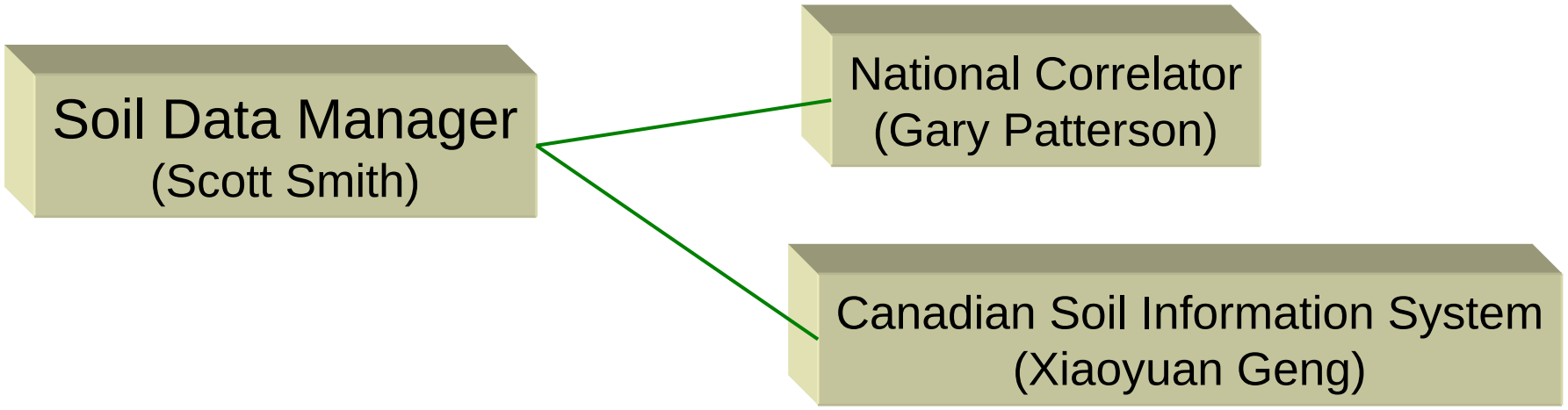
Function: Collaborative research in pedology, landscape modelling, technology development

CanSIS Unit (Ottawa)

20% of effort

Function: Data management QC/QA, geomatics, product development and web site, dissemination

Soil Resource Group: Management structure



NSDB Detailed Soil Survey Status and Metadata - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites

Address http://wms1.

Soil Landscapes of Canada: A broad-scale map product and database for environmental assessments

Version 3.0 for Agriculture
http://sis.agr.gc.ca/cansis

Version 1 and version 2 cover all of Canada, version 3 covers agricultural region all at a scale of 1:1,000,000.

Canadian Soil Information System (CanSIS) – Current activities

- Migration and loading of existing data and web pages to new enterprize GIS system
- Metadata creation, alignment with new digital base map
- Scanning of historical reports and maps
- Edit and update >5000 web pages of information
- Implementation of interoperable standards of OGC

Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

Canada

Soil Survey Data Access and Visualization Using Interoperable Web Services

Xiaoyuan Geng, Dave Rewitt, Jean Melnichin, Kelly Sonkiw, Gary Patterson, National Land and Water Information Service, Agriculture and Agri-Food Canada

Introduction

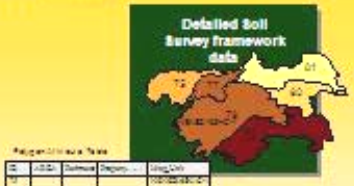
Traditional two-tier or three-tier client-server application architecture has been used in the USA and Canadian soil information systems for data management and distribution. These client-server architectures are often characterized by a focus on business functional requirements only. For example, a specific function such as download soil survey data is realized using proprietary formats; a soil web mapping application is designed and implemented using hard-coded data source locations and a highly customized client user interface. As a result of this type of function-specific design, many soil-related applications are isolated, monolithic and complex in nature. These implementations have a tendency to produce systems with high maintenance costs – they are unsustainable, non-interoperable and fragile.

To meet the needs of clients today, an application architecture should reflect the complete range of business requirements such as agility, interoperability, continuity etc. Thus, many architects and developers are now working to support the shift toward a service oriented

Common Data Structure of Soil Survey Data in the US and Canada

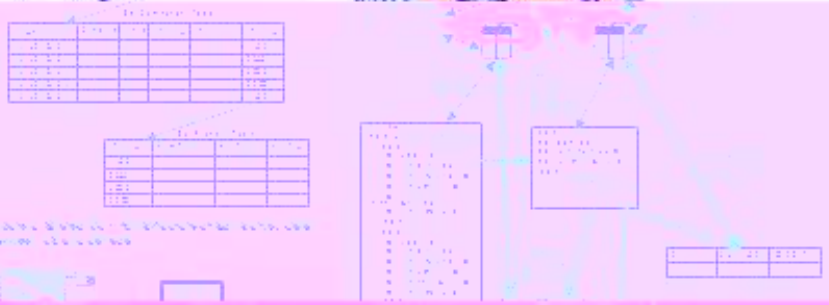
In the USA and Canada, digital soil survey data are often captured, managed and distributed with similar data models (Figure 1). For example, the Map Unit concept is often used. A map unit is a collection of areas defined and named according to their soil components or miscellaneous areas or both. Each map unit differs in some respect from all others in a survey area and is uniquely identified on a soil map. Each individual area on the map is a delineation. Map units consist of one or more components. In Canada, each map unit can have many components concurrently associated to these in the digital content for detailed maps and is commonly uncontrolled for the Soil Landscapes of Canada. In the USA, each map unit can have up to 21 components.

As Figure 1 illustrates, the relationship between the Map Unit Table and the Soil Component Table is "one to many". The relationship can be "one or many to many" bonds



How can interoperable Web services help?

To support web based interactive query, visualization and analysis, soil survey data needs to be served up using various Web services. WMS can be used for polygon data rendering and cartographic mapping over the Internet, a soil survey data WFS will provide flexible attribute access without using proprietary software, to support various data transformation and dynamic computational needs. WPS can be implemented and used. For example, through a WPS a GML-based WFS response can be transformed into a user-preferred format such as ESRI Shape or WKT format. The major benefit of Web service based soil data access is that we can make our subject matter specific data easy to access and use. Figure 4 demonstrates some of possible data flow scenarios based on prototyping work in Canada.



So where do we go from here?

- Organizational change triggered a call for a strategic plan for the future of the soil resource group within AAFC
- Opportunity to inform senior departmental executive of the challenges and opportunities ahead
- Opportunity to make recommendations for future strategic directions
- Expected outcome is that when decisions are made about the soil program they will be informed decisions


The National Land and Water Information Service

The National Land and Water Information Service

Strategic Plan for the Delivery of Soil Resource Information within AAFC

Document Version 1.1

May, 2007

Prepared for:

Environmental Health Science Program
National Land and Water Information Service

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

Canada

Strategic Plan

- Current supply of and demand for soil data
- Outlines HR trends and needs, options and implications
- Strategic future directions

Soil Resource Group – Strategic Directions

1. Maintain national network of regional offices with centralized correlation, data management and geomatics functions.

2. Focus on three product lines:
   - -Soil Landscapes of Canada (1:1M scale)
   - -Update to create seamless provincial coverages at common scale
   - -National Pedon Database
   - Interpretive products relating to agriculture and the environment.

Soil Resource Group – Strategic Directions

3. Actively seek to utilize new technologies to update soil map products wherever possible
   -LandMappR, SoLiM, Imagery, DEM
4. Achieve effeciencies through partnerships and collaborations
   -Multi-agency product development
   -Seek external funding wherever possible

5. Utilize the National Land and Water Information Service to make CanSIS products publicly available over the internet via the best and most current geomatics technologies available.

Overview of Work Plans

- Soil Landscapes of Canada
- Provincial coverages
- Detailed mapping- range of activities at regional and provincial scales
- National Pedon Database
- Scanned maps and reports
- Interpretations

Soil Landscapes of Canada (Wally Fraser)

Version 1 and version 2 cover all of Canada, version 3 covers agricultural region.
Scale of 1:1,000,000

- SLC is used for scaling up: models run on soil-landform components with land use, management and climate data from other sources.

-SLC supports agri-environmental indicators, environmental farm scans, greenhouse gas emissions accounting.

-SLC is the basis of the Ecological Framework for Canada.

National Map

SLC polygon

Soil Component Data

(SN and SL Tables)

Detailed Soil Maps (Jean-Marc Cossette and David Howlett)

Provincial soil map compilations

- 1:100K for AB SK MB
- 1:50,000 for ON, NB
- 1:20K PE
- One legend, seamless coverage, modern base for each province

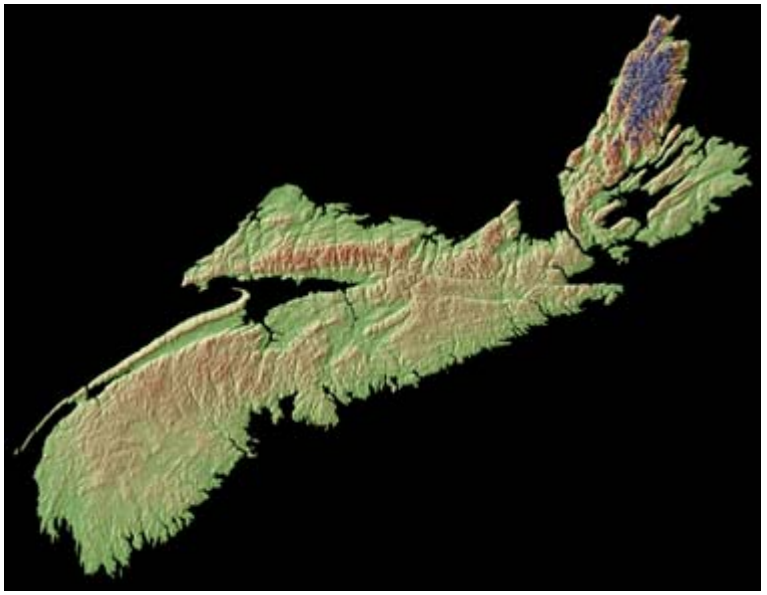
Regional assessments are possible with seamless provincial coverages as in Alberta

Detailed Soil Maps (Jean-Marc Cossette and David Howlett)

County and project area maps

Standard file structure and content

- Different scales, different legends (eg. BC and QC)
- Often organized by County to produce patch-work quilt of coverage
- Some value-added, e.g. digitized tile drainage, drape on DTM as is done in parts of Nova Scotia
- Some provinces thinking about a single coverage
- Mapping upgrades to some areas; fitting to modern base in others



National Pedon Database (Barb Lacelle and Luc Lamontagne)

Data from field sampling sites

Important as model input and to populate soil map databases

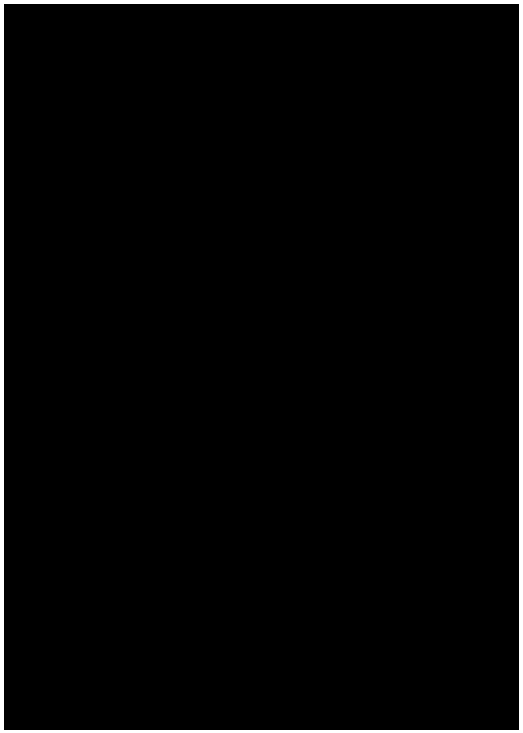
NDL Newdale Series

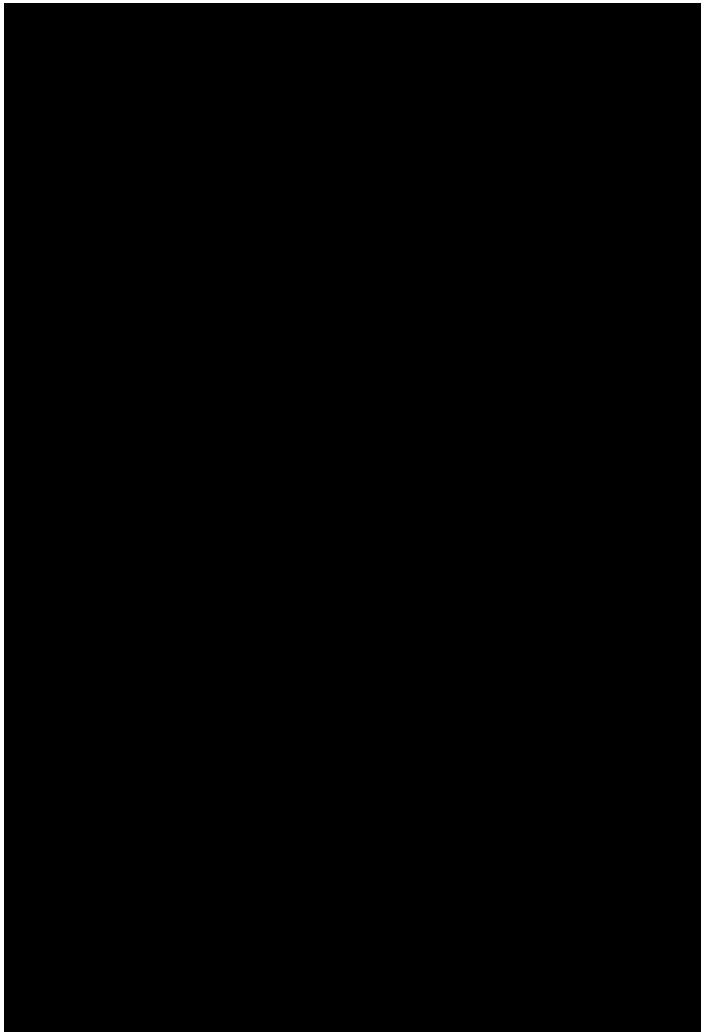
Orthic Black Chernozem

Loamy glacial till

Scanned maps and reports (Peter Brimacombe)

- For paper world clients
- For archival purposes





National Scope Interpretations – Nutrient Management Planner
(Tony Brierley and Glenn Lelyk)

Combines soil data with climate, surficial geology and well-log data

Summary of Data Integration

National Scope Interpretations - Land Suitability Rating System (Tony Brierley and Glenn Lelyk)

Combines soil, climate, and landscape data

LSRS - background

- Agronomic Interpretations Working Group established in 1988

- Guidelines:
  - Retain 7 class CLI concept
  - Be crop specific
  - Be national in scope
  - Expert system using existing data
  - Automate

- Crops
  - Spring seeded small grains (wheat, barley & oats)
  - Corn
  - Canola
  - Soybean
  - Forage (alfalfa, brome grass)

LSRS – Factors

Factor	Relationship	Data
Climate	Crop flexibility	Gridded 10km^2 1961-90 climate normals (P-PE & EGDD), rolled up to SLC
Soil	Productivity	NSDB – soil attributes
Landscape	Sustainability	NSDB – slope and slope length

Special interpretations

- Wide range of crop and engineering suitabilities in different regions of the country
- Prioritization of list required based on user requirements

Summary - The New Reality

- Future size of the federal soil survey group is probably going to include about 45 to 50 permanent employees.
- Our pressure is to maintain national/regional map data products using latest GIS and web service technologies
- Focus on agri-enviromental interpretations
- Benefit from National Land and Water Information Service – will provide access to developers, IT, partnerships etc


Canada